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ЛИЙНО-МАГНИЕВЫЕ СОЛИ В ЗАЛЕЖАХ ИНОВРОЦЛАВ И ВАПНО

(Резюме)

В центральной части Польши, в геологическом районе т. наз. куявского вала, оложено несколько соляных куполов цехштейнового возраста. Впервые был ружен соляной купол в Иновроцлаве, впоследствии в Вапне (около 40 км. ападнее г. Быдгощ). В этих двух местностях находятся копи каменной соли. Наличие калийно-магниевых солей в копях Иновроцлав и Вапно, преимуще- нно в виде тонких прослоек среди массы каменной соли, было известно из- а.

В настоящей статье авторы представляют результаты наблюдений над бо- значительными обнажениями калийно-магниевых солей в вышеупомянутых х в связи с геологической структурой залежей. Петрографическим методом и исследованы более значительные накопления этих солей. Авторы пытались новить их генезис в связи с калиеносными членами соляной серии.

Хотя накопления калийно-магниевых солей в копях Иновроцлав и Вапно настоящих условиях не представляют экономического значения, однако по- нные результаты исследований и вытекающие из них выводы могут иметь ние на уточнение знакомства цехштейновой соленосной формации в Польше. выводы касаются главным образом палеогеографических условий седимента- и стратиграфии соляной серии.

J. POBORSKI, K. PROCHAZKA & A. WALA

POTASSIUM-MAGNESIUM SALTS IN INOWROCŁAW AND WAPNO

(Summary)

ABSTRACT: A report is given of survey work in potassium-magnesium s exposures within the mines of Inowrocław (German: Hohensalza) and Wap (Western Poland). The conclusions drawn refer mostly to palaeogeographic co ditions of sedimentation, and to the stratigraphy of the salt series. They are of som importance for the study of the Zechstein salt-bearing formation in Poland.

A number of salt domes belonging to the Zechstein occur in Central Polan within the geological unit of the so-called Kujawy Ridge. That of Inowrocław the first to have been discovered, that of Wapno, 40 km. to the SW of Bydgosz (German: Bromberg), coming next. In both these localities there are older ro salt mines which are now being worked out on a largely extended scale. This h led to a system of excellent artificial exposures of the Zechstein salt series.

Occurrence of potassium-magnesium salt has long been noted both in t Inowrocław and the Wapno mines, mostly as thin intergrowths within the p dominant rock salt mass.

In 1955 the authors surveyed the more important potassium-magnesium s exposures in the mines at Inowrocław and Wapno from the aspect of the geologic structure of the local deposits, they made a petrographic study of the maj exposures, and they attempted to clear up the problem of their genesis in co nection with the potassium-bearing members of the salt-series.

Potassium-magnesium salt in the salt mine „Solno" of Inowrocław

These salts are to be found in various parts of the Inowrocław mine a rather thin layers, irregular intergrowths and veins of varying development. Onl quite exceptionally do they attain a thickness in excess of several meters. Inde pendently of sites of concentrated occurrence they are also found in a state of stron dispersion as isolated grains and small crystalline aggregates, layers only som milimeters in thickness and other fine intergrowths in the rock salt, thus constitu ting meagre potassium-bearing members of the salt series.

The writers are here concerned with those few exceptionally strong concen trations of potassium-magnesium salt, which are associated with the cardina members of the salt series and are discernible in the vertical profiles of severa mine levels.

The largest and most important concentration of potassium-magnesium salts eveloped as a carnallite rock in galleries 19, occurring there as a lenticular r within bedded, grey-white older rock salt (table I, see the Polish text). This ıation consists of the four layers which have been shown in a detailed section allery 19 in level IV (see fig. 2, layers *a–e*). In general, as is to be inferred ı petrographic studies, the here mentioned assemblage of layers *a–e* (see below: ription of fig. 2) is shown to be a kieserite-halite-carnallitite with an average) per cent weight content of the mineral carnallite.

The genesis of the described carnallite rock, as well as that of other potası-magnesium salt occurrences, has been cleared up from the stratigraphic aspect ne salt series with consideration to the internal tectonics of the salt dome.

The stratigraphy of the Inowrocław salt series has been determined by ving a comparison with the classical Zechstein profiles of Germany. Already he outset of these comparative studies it was disclosed that the Inowrocław ıation is a vertical development of the Zechstein, greatly resembling the profile he Hannover region.

The salt series, thus far confirmed in Inowrocław, is made up of the following or salt layer assemblages, i. e. of salt cyclothems:

cyclothem IV — salts of youngest age
cyclothem III — salts of younger age
cyclothem II — salt of older age

The carnallite rock in galleries 19 is a syngenetic product of the salt series, ı readily recognisable stratigraphy. It is, indeed, the typical potassium salt ırring in the uppermost cyclothem horizon of the older salts, the so-called sfurt horizon.

Another major formation in the Inowrocław mine containing potassiumnesium salts is a layer of sylvinite in galleries 540 (table II). The sylvinite there ırs nearly conformably within the bedded younger rock salt, as a non-continulayer displaying greatly varying range of thickness. This strongly deformed c stratum contains a vein of coarse crystalline sylvine, descending from level V.

Sylvinite is a non-bedded rock of red-grey colouration, with a massive ıcture. The chief rock-building minerals here are sylvine, halite and polyhalite. some portions polyhalite is altogether replaced by kainite. Hence the described c is a polyhalite sylvinite, in parts — kainite sylvinite. It is contaminated by ydrite and argillaceous matter.

The vein which infills the sylvinite crevice consists of white coarse crystalline ine. Larger crystals of white halite are here and there embedded in the sylvine s. It also contains some kidney-shaped loaves and concretions of creamured polyhalite (pl. VIII, fig. 2). Structural details of the sylvine vein are strated in the section of a gallery in level VI (fig. 5).

The sylvinite layer in gallery 540 is a syngenetic formation of the salt ser since it lies more or less conformably within the bedded salt rock mass, in so-called salt "with anhydrite threads", which is a commonly known potassiu bearing member of the salt series in the lower zone of the younger salts. It possible that this sylvinite corresponds to the "Ronnenberg" horizon in the bott division of the younger salts in northern Germany.

The sylvine-halite vein in galleries 16 constitutes the third major prod here. It infills a crevice in the bedded, younger, pink-grey rock salt, dens interwoven by anhydrite. With a view of illustrating the dimensions in the occ rence of this vein, a vertical section has been drawn of galeries 16 (table III). T structural details of the vein have been shown in the section of a gallery on le V (fig. 6).

The here mentioned vein in galleries 16, like all other veins and knots, is epigenetic product. It is a striking feature of the fissural products in the Inow claw mine that they occur mostly in one stratigraphic member only, that is in s "with anhydrite threads", in the lower zone of the younger salts. On the whole is a poor potassium-bearing member of the salt series, with relatively less mecha cal resistance. The material infilling the crevices is supplied by the walls of t crevices being leached by circulating water solutions.

Potassium-magnesium salts in the salt mine at Wapno

Concentrations of these salts thus far recorded from the salt mine at Wap occur in the marginal zone of the salt dome, mostly in levels V and VI of the mi The strongest concentration, and one presenting most interest is, however, situa in the north-western termination of the main gallery in level VI (fig. 7; see belo Description of fig. 7).

The here described concentration of potassium-magnesium salts, as well others, thus far recorded from the Wapno mine, are syngenetic products of t salt series there and belong to the horizon of older potassium salt (the Stassfu horizon).

Although in the present stage od development the concentrations of potassiu magnesium salts in the salt mines of Inowrocław and Wapno are of no econom value, yet data secured by survey work there and the inferences drawn may le to a better knowledge of the Zechstein salt-bearing formation in Poland. The inferences are mainly concerning palaeogeographical conditions of sedimentati and stratigraphy of the salt series.

Salt Beds Institute
College of Mining & Metallurgy
Kraków, May 1956

DESCRIPTION OF FIGURES IN THE POLISH TEXT

Fig. 1 (p. 345)

Honey-yellow rock salt with dispersed minerals: *ka* carnallite, *po* polyhalite, *anh* anhydrite — Inowrocław mine × 30

Fig. 2 (p. 346)

Carnallite bed in the Solno mine (Inowrocław), level IV, gallery 19
white-grey rock salt; s_2 ditto with anhydrite threads; *a* pink brecciated carnallite
h lumps of rock salt; *b* massive red-grey carnallite; *c* honey-coloured rock salt
h tresses of carnallite and kieserite; *d* pink layered carnallite; *e* rock salt with tresses of carnallite; *A* tectonic joint with brecciated carnallite

Fig. 3 (p. 351)

Structure of polyhalite in sylvinite — Inowrocław mine
po polyhalite, *t* halite × 30

Fig. 4 (p. 352)

Kainite in sylvinite — Inowrocław mine
kai kainite, *h* halite × 30

Fig. 5 (p. 353)

lvine vein in a sylvinite bed in the Solno mine (Inowrocław) level VI, gallery 540
ock salt with anhydrite threads; *2* rock salt with red tresses of sylvine; *3* red
vinite — vein products; *4* white crystalline sylvine; *5* pink polyhalite; *6* crystalline honey-yellow halite

Fig. 6 (p. 354)

Vein of sylvine-halite in the Solno mine (Inowrocław) level V, gallery 16
ock salt with threads of anhydrite — vein products: *2* crystalline honey-yellow halite; *3* coarse-grained snow-white sylvine; *4* coarse-grained blue halite

Fig. 7 (p. 365)

rnallite bed with hard salt intergrowth in the Wapno mine, level VI, main gallery
ine-grained, massive white rock salt; *a* pink massive, non-homogeneous carnallite;
ard brown layered salt with kieserite; *c* brown rock salt with intergrowths of hard
t; *d* massive red carnallite, partly brecciated With adjacent sketch map

Fig. 8 (p. 366)

Structure of pink fine-grained carnallite — Wapno mine
kai kainite; *ki* kieserite; *h* halite

Table I (facing p. 344)

Carnallite bed in the Solno mine (Inowrocław)
galleries 19
I — sketch map of carnallite bed, level III, drawn to scale 1 : 1000
II — simplified stratigraphic sketch diagram
lder rock salts; *2* older potassium salt; *3* main anhydrite seam; *4* younger rock
ts; *5* younger brown „zuber" (loamy breccia with salt crystals); *6* the youngest rock salts

III — section A-B, drawn to scale 1 : 400

1 rock salt; *2* rock salt with anhydrite threads; *3* salt with carnallite and kiese intergrowths, *4* kieserite carnallite; *5* vein of halite with kieserite

Table II (facing p. 348)

Sylvinite bed in the Solno mine (Inowrocław)
galleries 5 and 540

I — sketch map of sylvinite bed, drawn to scale 1 : 1000

II — simplified stratigraphic sketch diagram

1 older rock salts in general; *2* younger rock salts with a sylvinite bed *3*; *4* youn brown „zuber"; *5* the youngest rock salts

III — horizontal sections of the sylvinite bed in the particular levels, drawn scale 1 : 400

IV — section C-D

1 rock salt with anhydrite threads; *2* rock salt with tresses of sylvine; *3* sylvin *4* vein products (sylvine, polyhalite, halite)

Table III (facing p. 354)

Sylvine-halite vein in the Solno mine (Inowrocław)
galleries 16

1 rock salt with anhydrite threads; *2* white crystalline halite; *3* blue coarse-grain halite; *4* snow-white coarse-grained sylvine; *5* blue coarse-grained sylvine; *6* g anhydrite

Pl. I

Fig. 1

Kieserite-halite carnallite — Inowrocław mine

Grainlets of kieserite disposed where grains of carnallite and halite forming rock matrix coalesce. Banded twinning conspicuous in carnallite

Micr. thin section ×

Fig. 2

Honey-yellow rock salt, adjacent to the carnallite bed — Inowrocław mine

Within the halite matrix carnallite grains are visible Micr. thin section ×

Fig. 3

Grains of kainite separated from the kainite sylvinite — Inowrocław mine

Powder prepar. ×

Fig. 4

Kainite sylvinite — Inowrocław mine

Fused, angular shaped, intergrown grains of kainite are discernible within the gr halite matrix Micr. thin section ×

Pl. II

Fig. 1

Vein of sylvine in a polyhalite sylvinite bed — Inowrocław mine

Cryptocrystalline and laminar pattern of the vein polyhalite

Micr. thin section ×

Fig. 2

Massive pink carnallite — Wapno mine

e grainlets of kieserite concentrated where carnallite grains forming the rock trix coalesce Micr. thin section × 70

Fig. 3

Hard kieserite salt — Wapno mine

Minute oval or angular kieserite grains within the dark-grey halite matrix Micr. thin section × 70

Fig. 4

Hard kieserite salt — Wapno mine

ıute concentrations of kieserite grains (white and dark), also sylvine grains (grey) ernible in the light-grey halite matrix Micr. thin section × 150

Pl. III

Fig. 1

Exposure of carnallite rock — Inowrocław mine in gallery 19, level VI

wall is seen to be covered by weathering products which, upon falling down, are heaped on the gallery floor

Fig. 2

ck cover of weathering products on the carnallite wall in gallery 19 of level IV — Inowrocław mine

horizontal belt with a furrow shows the site where the sample was collected

Pl. IV

Fig. 1

Layered part of carnallite rock in the wall of gallery 19, level VI Inowrocław mine

Fig. 2

Banded structure of carnallite rock in the wall of gallery 19, level VI Inowrocław mine

Layer *d* contacting layer *e* (on right hand side)

Pl. V

Fig. 1

f of boracite (white) in carnallite wall of gallery 19, level VI — Inowrocław mine

Fig. 2

Sylvinite wall in gallery 5 of level VI — Inowrocław mine

wall is covered by weathering products. Note horizontal furrow for collection of sample

Pl. VI

Crystal cave in the wall of chamber 539 in level IV — Inowrocław mine

Pl. VII

Fig. 1

Illustration of a demolition of crystal cave in chamber 539 in level IV
Inowrocław mine
The broken up halite crystals are heaped up on the floor of the chamber

Fig. 2

Fragment of sylvine-halite vein in the wall of chamber 539 in level IV
Inowrocław mine
White concentration of sylvine with rim of halite coloured honey-yellow thro
contact with sylvine

Pl. VIII

Fig. 1

Texture of sylvinite in sample collected from gallery 540 in level VI
Inowrocław mine
Sample 31 cm. broad on its base

Fig. 2

Kidney-shaped concretions of polyhalite in sylvine wall from gallery 540 in le
VI — Inowrocław mine

Pl. IX

Fig. 1

Layer of carnallite rock in chamber 44, level V — Wapno mine

Fig. 2

Exposure of potassium-magnesium salts in terminal portion of the main galler
level VI — Wapno mine
North-east wall showing bedded structure

Pl. X

Fig. 1

Hard layered salt, contacting carnallite rock (on right hand side) in the w
of main gallery in level VI — Wapno mine

Fig. 2

Sample of layered hard salt from exposure in main gallery, level VI — Wapno m

КОКОШИНЬСКА и К. БИРКЕНМАЙЕР

ЛЬБСКАЯ ФАУНА В НЕДЗИЦКОЙ СЕРИИ КЛИППОВОГО ПОЯСА ПЕНИН (ЦЕНТРАЛЬНЫЕ КАРПАТЫ)

(Резюме)

В пенинском клипповом поясе Польши, в долине Косаржыска возле Фальш-ина обнажается полный стратиграфический разрез недзицкой серии (*4, 6, 7, 8*),* нимающий звена от нижнего мальма до сеномана и турона (рис. 1, стр. 373 льского текста). В этом разрезе выступает непрерывность седиментации и со-асованность последствия отдельных стратиграфических горизонтов.

Представленная здесь макрофауна альбских отложений недзицкой серии опре-лена Б. Кокошиньской.

Альбские образования, мощностью едва около 4 м. (т. наз. высшие глобиге-ино-радиоляриевые слои), являются пелагическими отложениями. Это сланце-тые зеленые и пятнистые мергеля с прослойками черных мергелистых сланцев пиритом. Кроме того здесь выступают мергелистые зеленоватые или зелено-то-голубоватые пятнистые известняки и черные известняки, которые содержат диолярии и планктонные фораминиферы, как глобигерины и *Thalmanninella cinensis* (Gandolfi) (*8*). В черных сланцах, частично тоже в пятнистых мергелях, йдена многочисленная макрофауна, плохой сохранности, пиритизованная или монитизированная. Установлены виды:

Hamites aff. *attenuatus* Sow.	5 экз. (рис. 2)
Hamites aff. *flexuosus* d'Orb.	4 экз. (рис. 3)
Neohibolites minimus (List.)	1 экз. (рис. 4)
Aucellina aff. *gryphaeoides* Sow.	5 экз. (рис. 5)
Tellina sp.	5 экз.

Определенная фауна указывает на альбский возраст осадков. *Neohibolites inimum* (List.) и *Aucellina* aff. *gryphaeoides* Sow. указывает на связь клиппового ссейна с северно-европейской провинцией. Л. Горвиц (*11*) еще раньше сделал добное заключение относительно исследованного им „нижнего сеномана" клип-ового пояса Пенин, где он констатировал наличие *Neohibolites ultimus* (d'Orb.) *Aucellina gryphaeoides* Sow.

* Цифры курсивом в скобках относятся к списку литературы в польском тек-те. Приведенные рисунки — см. польский текст.

Особыми характерными признаками отличается пелагическая глоботрунка глобигериновая микрофауна альбских и сеномано-туронских отложений недзи кой серии с выдающимися чертами средиземноморской провинции.

Л. Горвиц (9) первоначально выделял в Пенинах альб с *Belemnites minim* List. В своих последующих работах (*13, 10, 14, 11*) однако он отрицал нали альба, считая, что трансгрессия „клиппового покрова" имела место лишь толь в нижнем сеномане.

Описанная фауна альбских отложений недзицкой серии свидетельствует о с ществовании этого яруса в польском секторе клиппового пояса.

KOKOSZYŃSKA & K. BIRKENMAJER

ALBIAN FAUNA OF THE NIEDZICA SERIES FROM THE KLIPPEN-BELT OF THE PIENINY MTS.

(Summary)

BSTRACT: The Albian fauna of the Niedzica series from the Klippen-belt of the ieniny Mts. (Central Carpathians) described here consists of ammonites, pelecyds and a belemnite, and displays north-European character testifying to the nnection of that province with the Middle Cretaceous Klippen-belt basin. The crofauna occurring in rocks here considered consists of globigerines and globouncanas; it is of Mediterranean type.

Within the Kosarzyska Valley, near Falsztyn, in the Klippen-belt of the Pieny Mts., K. Birkenmajer has discovered excellent outcrops of Jurassic and etaceous links from one of the Klippen-belt series. This series was first called ieniny passage series II of the Kosarzyska type" (*5*)*, later the Niedzica series *6, 7, 8*)[1]. A horizon of marly shales and marls was recorded from this series, elding a fairly abundant but poorly preserved fauna. These strata are referable the upper part of the so-called beds with *Globigerina* and *Radiolaria*. They have en assigned to the Albian age on ground of their position immediately below the nomanian *Globotruncana* marls with *Rotalipora apenninica* (Renz), and of analoes with similar deposits in the Slovakian part of the Pieniny Klippen-belt. The rrectness of this assignment may find a confirmation in the presence of *Thalmannella ticinensis* (Gand.) recently recorded there *(8)*.

Where the Kosarzyska Valley road passes over a bridge crossing the Falsztyn eam (fig. 1), a small waterfall is seen falling over a ledge 3.5 m. high, consisting vertically arranged Tithonian and Lower Neocomian limestones of the Niedzica ries. Beneath the waterfall ledge, over an area of about 5 m., black and blackyeen marly shales are visible with intercalations of siliceous limestones and radiorian cherts similarly coloured, also grey-black *Globigerina* siltstones with

* Figures in *italics* in brackets refer to the Literature quoted at the end of e Polish text. Pages of drawings, plates and tables refer also to the Polish text.

[1] V. Uhlig (*22, 21*, p. 623, fig. 12) here indicates "Roter Knollenkalk (Czorsztyr Kalk), Brachiopoden-und Krinoidenkalk (Malm und Titon) — Subpieninisch", t in a mantle of "Oberkreide (Puchower Mergel, Inoceramensandsteine mit Hieroyphen, Konglomerate)". A hand-drawn map by L. Horwitz (*12*) indicates Klippen the Czorsztyn series (equivalent of Uhlig's Vesteinerungsreiche Facies — Subeninisch) of the "lower digitation" built by radiolarites (Upper Callovian-Oxfordn?) and Tithonian limestones which are set in a Klippen mantle composed of wer and Middle Cenomanian.

fragments of carbonized wood. This is the lower part of „beds with *Globigen* and Radiolaria", here recognized as the equivalent of the Barremian-Aptian str Next, in concordant sequence follows a unit of almost vertically bedded Alb strata, 4 m. in thickness represented by shaly marls green and spotted with int calations of black pyritic marly shales and limestones. *Thalmanninella ticiner* (Gand.) has been recorded from the rocks here. Further downstream we see gre and then variegated and cherry-red *Globotruncana* marls. Their lower port contains an assemblage of microfauna with *Rotalipora apenninica* (Renz), indi tive of the Cenomanian, while the upper portion yields foraminifers from group of *Globotruncana lapparenti* Brotz., suggestive of the Turonian.

The next Albian outcrop is recorded about 200 m. downstream. In the ba escarpment are first exposed red, greenish and variegated *Globotruncana* ma (Cenomanian); Albian rocks follow behind developed as marls and black colou marly shales with pyrite; also bedded marls and limestones, greenish and blu green, and spotted or black limestones. The incomplete thickness of these sedime does not exceed 2 m. The marls have revealed a rather poor foraminiferal assembl with Albian forms such as *Thalmanninella ticinensis* (Gand.) In black shales, a partly in spotted marls, the occurrence is recorded of fairly abundant but ba preserved pyritized or limonitized fauna of ammonites, pelecypods and a spe of belemnite. Of these, B. Kokoszyńska has identified the following:

Hamites aff. *attenuatus* Sow.[2]	5 specimens	(see fig. 2)
Hamites aff. *flexuosus* d'Orb.	4 „	(see fig. 3)
Neohibolites minimus (List.)	1 „	(see fig. 4)
Aucellina aff. *gryphaeoides* Sow.	5 „	(see fig. 5)
Tellina sp.	5 „	

The just cited fauna indicates the Albian, probably Middle Albian. Accord to d'Orbigny (*17*), *Hamites attenuatus* reaches its utmost development in the Ga where it is an index fossil. In the Lower Gault of the Paris Basin, in the Rhô Valley, in Switzerland and in England (Speeton and Folkestone clays) this fo is very frequent. E. Passendorfer (*18*) mentions it from the glauconitic limesto of the *Hoplites dentatus* horizon, and from marls with *Stoliczkaia dispar* of high-Tatric series. *Hamites flexuosus* d'Orb. occurs in the Albian of France a Switzerland. E. Passendorfer (l. c.) cites *Hamites* cf. *flexuosus* d'Orb. also fr glauconitic limestones of the *Hoplites dentatus* horizon in the high-Tatric seri

Neohibolites minimus (List.) is recorded from the Middle Albian of north-European province (England, Germany, north-western France and no Caucasus). D. Andrusov (*2*, *3*) cites this form from Lower Albian marls (*Leymerie tardefurcata* horizon) of the Pieniny Klippen-belt in the Orava Valley and fr

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[2] For synonimics see page 376-378 of the Polish text.

aerosideritic Lower Albian marls in the Váh Valley. Within the Tatra Range, Passendorfer *(18)* has encountered this form in the glauconitic marls of the *Ho-es dentatus* horizon and in marls with *Stoliczkaia dispar* of the high-Tatric series. the Flysch Carpathians, *Neohibolites minimus* has been encountered by W. Rogala B. Kokoszyńska (*15*) in the passage beds between the Lower and Middle taceous (Aptian-Albian).

Aucellina gryphaeoides occurs in the Upper Gault of Folkestone and Speeton, in the Lower Cenomanian.

In his first paper on the Klippen-belt of Poland L. Horwitz *(9)* has differenti-d grey, often spotted marls, sometimes passing into compact limestones of no at thickness, where he found *Belemnites minimus* List. These beds which, on dence of that author's description and of the cited by him belemnite, may sonably be assigned to the Albian, have by Horwitz been referred to the Cre-eous mantle connected with "Czorsztyn facies". Unfossiliferous, Cenomanian-onian? "Púchov marls", frequently red-coloured, were said to overlie them. his later works, however, L. Horwitz (*13*, *10*, *14*, *11*) revised his opinion, asserting t it is not the Albian with *Neohibolites minimus* but the "Lower Cenomanian" h *N. ultimus* (d'Orb.), *Aucellina gryphaeoides* Sow. and *Ostrea vesicularis* Lam.[3] t may be the lowest member of the so-called Older Klippen-Mantle.

The Lower Cenomanian is by that author regarded as a unit transgressing r the Klippen series. Since, however, he has referred many rocks to that unit, ention was called, and rightly so, already by D. Andrusov (*1*, *2*, *3*) that some of m doubtlessly represent lower members too, the Albian particularly.

Of the facies, differentiated by Z. Sujkowski (*14*) on ground of thin plates dy in the "Lower Cenomanian" of the Klippen-belt, the *Rosalina* facies undoubted- represents the Cenomanian, partly also the Turonian, while the *Globigerina* d the *Globigerina*-Radiolaria facies may correspond to the Albian.

The studied Albian fauna (probably Middle Albian) from the Niedzica series the Kosarzyska Valley implicitly confirms the occurrence of that stage in the niny Mts. Ammonites, pelecypods and a belemnite species here display features racteristic of the north-European province, in contrast to the pelagic forms the globotruncanes recorded mostly from the Mediterranean province. This plies to Cenomanian fauna too, as stressed already by L. Horwitz (*11*).

The Albian from the Niedzica series reveals closest lithological similarity thin-bedded silty marls from Zemianska Dedina in the Pieniny Klippen-belt the Orava Valley which contain a fauna of *Leymeriella tardefurcata* horizon orded by F. Foetterle, and have recently been described with more details by Andrusov (*2*, *3*).

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[3] *Pycnodonta vesicularis* (Lam.) is recorded by D. Andrusov (*2*, *3*) from the bian of the Pieniny Klippen-belt in the Váh Valley.

It differs considerably from the sphaerosideritic Albian marls from Klippen-belt of the Váh Valley, encountered in the vicinity of the Manín ser

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Kraków, March 1956

DESCRIPTION OF FIGURES IN THE POLISH TEXT

Fig. 1 (p. 373)

Sketch map of the outcrop with Albian fauna of the Niedzica series in the Ko rzyska Valley near Falsztyn *Del. K. Birkenma*

Niedzica series: 1 green radiolarites and upper red radiolarites (Lower Mal *2* upper nodular limestone (Kimmeridgian-Berriasian-?Valanginian); *3* cherty lir stone (Valanginian-Hauterivian); *4* beds with *Globigerina* and Radiolaria, lo part (Barremian-Aptian); *5* beds with *Globigerina* and Radiolaria, upper part w Albian fauna; *6* green, variegated and red *Globotruncana* marls (Cenomani Turonian) with intercalations of sandstones in the upper part; *7* Flysch depo of Middle Cretaceous (?Turonian) — *Upper Cretaceous mantle*: *8* Jarmuta b (Maestrichtian) — *9* escarpments and margins of terraces — *10* talus — *11* allu cone (Holocene) — *12* non-divided Quaternary cover

W waterfall — *A* outcrop with Albian fauna

Fig. 2 (p. 376)

Hamites aff. *attenuatus* Sow.

Del. K. Birkenma

Four specimens (*a-d*) Nat. s

Fig. 3 (p. 377)

Hamites aff. *flexuosus* d'Orb.

Del. K. Birkenma

Two specimens (*a-b*) Nat. s

Fig. 4 (p. 378)

Neohibolites minimus (List.)

Del. K. Birkenma

Fig. 5 (p. 378)

Aucellina aff. *gryphaeoides* Sow.

Del. K. Birkenma

Two specimens (*a-b*)

КОЗИКОВСКИ

ГЕОЛОГИЧЕСКИЙ ОЧЕРК ОКРЕСТНОСТЕЙ РАБКИ

(Резюме)

Продолжая работы Я. Новака (*13*),* Б. Буяльского (*2*, *3*) и Б. Свидерского (*18*), автор дает новую оценку стратиграфии и тектоники окрестностей Рабки. исследованной территории отмечено развитие трех тектонических элементов шего порядка: магурского покрова, элемента Ропа-Писажова (?) и кросноск слоев тектонического окна Мшана Дольна. Стратиграфическое разделение х элементов основано на литологических наблюдениях и на аналогиях по ошении к другим частям магурского района.

Рассматривая тектонику района съемки, автор обращает внимание на залещие под магурским покровом нагроможденные структуры, связанные почти лючительно с зонами больших поперечных депрессий. Можно предполагать, эти структуры могут быть встречены бурениями тоже между местностями ь возле Звардоня и Мшана Дольна.

* Цифры курсивом в скобках относятся к списку литературы в польском те.

H. KOZIKOWSKI

ON THE GEOLOGY OF THE RABKA REGION

(Summary)

ABSTRACT: The stratigraphy and tectonics of the Rabka area (Western Beski Poland) are presented. The stratigraphic column of three tectonic units of th area, i. e. the Magura nappe, the Ropa-Pisarzowa unit and the tectonic wind of Mszana Dolna is given and analogies are drawn in relation to other parts of Magura region.

New aspects of the stratigraphy and tectonics of the Rabka area (West Beskidy, Poland) are presented in this paper, previous works by J. Nowak (1 B. Bujalski (*2*, *3*), B. Swiderski (*16–18*) and L. Watycha (*25*) being, moreover, tak into consideration.

Three major tectonic units have been differentiated within the investig territory. They are: the Magura nappe, the Ropa-Pisarzowa unit and the tect window of the Mszana Dolna with the Krosno beds revealed therein. The str graphic column of these units is here based on lithological observations, also analogies in relation to other parts of the Magura region.

Inoceramus beds are the oldest strata of the *Magura nappe.* They may differentiated into three lithological facies: conglomerates, sandstones and sha with sandstones. Towards the top, the *Inoceramus* beds grade distinctly i variegated Eocene beds (*5*). In these the writer differentiates red shales, gre shales with sandstones and poorly developed thickly bedded sandstones, probab belonging to the so-called Ciężkowice sandstones type. The variegated Eocene be grade upward into sub-Magura beds, displaying a variable quantitative ratio marls, sandstones and shales. The Magura beds are the uppermost link in t lithology and stratigraphy of the Magura nappe.

The Ropa-Pisarzowa unit consists of Grybów beds where black and gre shales, as well as sandstones with black shales have been differentiated.

The Mszana Dolna tectonic window reveals Krosno beds only, showing a pr dominance of grey shales, with occasional non-calcareous black shales intercalatio and a more extensive series of sandstones with shales.

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* Figures in *italics* in brackets refer to the Literature quoted at the e of the Polish text.

After comparing his own results with those reported in works of authors ›erred to at the beginning of this paper, the writer undertakes a detailed report the tectonics of the mapped territory. Stress is laid here on the occurrence ›w the Magura nappe of the so-called superposed and uplifted structures (5) urring almost exclusively in zones connected with the major transverse depres- ıs (18). The possibility is pointed out of disclosing these structures by borings hin an area between the localities of Sól near Zwardoń and Mszana Dolna.

There is a lack of palaeontological evidence supporting the lithologic and tigraphic division of the Rabka area, which hinders an age assignment to the cribed beds. Neither may tectonic inferences drawn with respect to the Ropa- ırzowa unit be regarded as final, the evidencial material at disposal being ıfficient. An up-to-date map of the whole tectonic window of Mszana Dolna is, vever, being worked out by Professor J. Wdowiarz and will certainly help to ır doubts now existing in connection with these problems.

te Geological Prospecting Concern
Division of Cartography
Kraków, October 1952

DESCRIPTION OF FIGURES IN THE POLISH TEXT

Table I (facing p. 382)

Sketch geologic map of the Rabka area

Del. H. Kozikowski

alley Quaternary — *Magura nappe: 2* Magura beds — Sub-Magura beds: *3* dstones with shales, *4* shales with sandstones, *5* sandstones with marls and les, *6* marls with sandstones and shales — variegated Eocene beds: *7* green les with sandstones, *8* thickly bedded sandstones, *9* red shales — *Inoceramus* s: *10* shales with sandstones, *11* sandstones, *12* conglomerates — *Ropa-Pisarzowa* : *13* Grybów beds — *Mszana Dolna tectonic window,* Krosno beds: *14* grey es, *15* grey shales with black shales, *16* shales with thin bedded sandstones — overthrust — *18* longitudinal and transverse faults — *19* anticline axis — *20* syncline axis — *21* lines of sections.

Table II (facing p. 382)

Geological sections of the Rabka area

Del. H. Kozikowski

legend see Table I

КОЗИКОВСКИ и А. ЕДНОРОВСКА

ЕОЛОГИЧЕСКИЕ И МИКРОПАЛЕОНТОЛОГИЧЕСКИЕ ИССЛЕДОВАНИЯ В ДОЛИНЕ СЛОНИЦЫ

(Резюме)

СТРАКТ: Приводятся результаты геологических и микропалеонтологических следований в долине Слоницы (Западный Бескид, Польша). Г. Козиковски де-ьно описал геологический разрез этой территории, А. Едноровска — его ми-палеонтологию.

Флишевые образования долины Слоницы, являющейся частью магурского рова, исключительно однообразны. При выделении горизонтов трудности были одолены благодаря детальному исследованию в породах содержания карбона-и акцессорных минералов, равно как комплексов микрофауны.

На основании полевых и буровых работ констатировано под магурским по-вом залегание отдельной тектонической единицы, т. наз. глубинной единицы и, которая очередно лежит на еще одном, точно не определенном, тектони-ком элементе.

В пределах магурского покрова выделены иноцерамовые слои, представляю-здесь наиболее древнее литологическо-стратиграфическое звено, с несколь-и литологическими комплексами, а также пестрые эоценовые слои. Так на-аемые субмагурские слои на исследованной территории не констатированы.

Глубинная единица Соли, изученная на основании полевых и буровых работ, дставлена древнейшими субменилитовыми эоценовыми слоями, менилитовыми ями (в двух литофациях: фации черных сланцев и фации песчаников с конгло-атами) и кросненскими слоями.

Под глубинной единицей Соли пробурены слои отличающиеся своим петрогра-ческим характером, которые с вышележащими слоями контактируют несо-зно. Возможно, что это кросненские слои, принадлежащие вероятно к пред-урской единице.

Наиболее значительным тектоническим элементом магурского покрова яв-тся выступ иноцерамовых слоев. С востока этот выступ срезан большим по-ечным сбросом (таб. I при стр. 410 польского текста).

Глубинная единица Соли отличается тектонической двуделимостью. Низший мент представлен плоско надвинутой, вторично складчатой чешуей, на которой егает высший элемент сходного тектонического характера (таб. I). В районе ины Слоницы имели место по крайней мере 4 орогенические фазы, отделен-

ные периодами эрозии и денудации. Во время последней орогенической ф произошли менее значительные дислокации, заметные в высшем тектоничес элементе глубинной единицы Соли и в магурском покрове (рис. 2 и таб. Профиль Соли является классическим примером „нагроможденных структур" терминологии автора).

Из микропалеонтологических исследований А. Еднорoвской видно, что фа в серии мощных песчаников, принадлежащей к иноцерамовым слоям, оч бедна и исключительно агглютинирована. В сланцево-песчаниковой серии и церамовых слоев микрофауна более многочисленная; она состоит из долгов ных форм. Из 34 описанных видов, 12 видов существует от мела до настоящ времени, 17 — от верхнего мела до эоцена, 4 же вида описаны только из верхн мела: *Anomalina plumere* Tapp., *Dorothia lenis* Grzyb., *D. sublime* Grzyb. и *F teonina complanata* Franke.

В пестрых эоценовых слоях констатировано 2 разные комплексы агглютини ванной микрофауны: один — в красных сланцах, другой — в серых и зелен сланцах. Оба комплекса, представленные почти одними и теми же видами, р нятся только тем, что в красных сланцах отсутствует руководящая в эоц форма *Cyclammina amplectens* Grzyb., известная в серозеленых сланцах, вме того наблюдается массовое распространение *Glomospira charoides* (Jon. & Pa

В субмагурских слоях выступает бедная и лишенная характерных призн агглютинированная фауна. Микрофауна магурских слоев в районе Соли исследована.

Кросненские слои глубинной единицы Соли почти совершенно лишены крофауны. В менилитовых слоях распространена эоценовая фауна: особ многочисленны *Cyclammina amplectens* Grzyb. и *Cystammina subgaleata* Vaš

Стратиграфическое положение первого вида, до настоящего времени расс триваемого как руководящая форма для пестрых эоценовых слоев, следует реместить в направлении более молодых слоев, так как этот вид встречает в сланцах менилитовых слоев. В менилитовых слоях Соли найдены также 2 земпляра вида *Nummulites variolarius* Lmk. Вид этот Ф. Беда причисл к эоцену.

Эоценовая микрофауна встречается тоже в субменилитовых слоях.

На основании существующего материала не удалось установить возра предмагурского элемента. Видимая в разрезе на таб. I серия является исклю тельно песчаниковой, немногочисленные же сланцевые включения лишены м крофауны.

KOZIKOWSKI & A. JEDNOROWSKA

GEOLOGICAL AND MICROPALAEONTOLOGICAL RESEARCH-WORK WITHIN THE SŁONICA VALLEY

(Summary)

STRACT: The writers report the results of their geological and palaeontolo-
al research-work in the Słonica valley within the West Beskidy Range, Poland.
geological section of this region has been worked out by H. Kozikowski, while
Jednorowska has identified microfaunistic assemblages characteristic of the particular beds.

No systematic detailed geological studies have been undertaken within the nica valley (West Beskidy Range, Poland) since the year 1895 when it was pped by W. Szajnocha (*27*)* for the Geological Atlas of the Southern Provinces Poland. H. Kozikowski's survey work is the first since that time.

The Flysch of that part of the Magura nappe is exceptionally monotonous. ficulties in determination of its stratigraphic column have been overcome by thodical observation of the degree of calcification of rocks, of the occurrence them of accessory minerals and microfaunistic assemblages.

On evidence of field research and subsurface geological survey work the stence has been ascertained within this territory, below the Magura nappe, an independent tectonic unit, the so-called Sól depth unit, resting on another tonic element whose character has not thus far been discovered.

Within the *Magura nappe*, the *Inoceramus* beds were first to be distinguished. ey are the oldest litho-stratigraphic link, different, however, from its most nmonly known type. Two lithological facies have been differentiated in these ls, namely the shale-sandstone series and the thickly bedded sandstones. Their tical distribution and thickness varies (see fig. 2 and table I).

In variegated Eocene beds younger than the *Inoceramus* beds three litholo- al series have been differentiated: the red shales series, the shale-sandstone ies, and the sandstone series. The two latter ones are the most important, the dstone series being quite a distinct feature in the morphology of this area s. 1 & 2, table I).

The presence of glauconite and felspars, never recorded from sub-Magura ds of other already investigated areas, has been accepted as criterion for dis-

* Figures in *italics* in brackets refer to the Literature quoted at the end of Polish text. Pages of drawings, plates and tables refer also to the Polish text.

tinguishing the sub-Magura from the Magura beds which are the youngest lit stratigraphic element in this region. Since they are absent here, no sub-Mag beds are likely to occur at all in the investigated area.

The lower tectonic unit, called the *Sól depth unit,* is distinguished by completely different litho-stratigraphic composition which has been made kno by means of deep borings. The oldest element here are the sub-menilitic Eoc beds of grey-green colouration, toward the top associated with variegated sha These underlie menilitic beds separated into two distinct lithological facies, nam that of black shales, and that of sandstones with conglomerates with which sedimentation of these beds commenced. This last named lithological series developed best in the lower tectonic element of the Sól depth unit. Upwards t series grades into the Krosno beds which begin with a complex of thickly bed sandstones passing toward the top into a shale-sandstone series.

Below the Sól depth unit strata displaying entirely different petrograp character have been revealed by borings. They are moreover in unconforma contact with the overlying beds. These strata are most likely the Krosno be probably belonging to the *pre-Magura unit* (2).

A dome of *Inoceramus* beds, occupying an area of 1 square km. and charact istic by the great range of its tectonic forms, is the major tectonic element of Magura nappe within the Sól area. It consists of anticlines separated by nar synclines and a longitudinal dislocation. To the east it has been sheared off by extensive transverse fault. The continuation of these anticlines and syncline noted within younger strata of the east and west (see fig. 1).

The Sól depth unit is characterised by its bipartite tectonics (table I). lower element there is a scale, rather flatly superposed and secondarily fold with the upper element, displaying similar tectonics, resting on it.

In the Słonica valley region, no less than four mountain-building stages m have occurred, with intervening periods of erosion and denudation. During final orogeny, smaller dislocations developed, observable in the higher tecto element of the Sól depth unit as well as within the Magura nappe (fig. 2 a table I). The Sól section presents a classical example of the so-called uplifted a superposed structures discussed in another paper by H. Kozikowski *(14).*

Micropalaeontological studies by A. Jednorowska have disclosed that wit the thickly bedded sandstone series of the *Inoceramus* beds the fauna is extrem poor and exclusively agglutinative. Within the shale-sandstone series of *Inoceramus* beds the microfauna shows greater abundance, and contains longev forms. Of the 34 identified species 12 have persisted from the Cretaceous do to the present times, 17 have existed from the Upper Cretaceous through the Eoce while 4 species have been recorded from the Upper Cretaceous only: *Anomal plumere* Tapp., *Dorothia lenis* Grzyb., *D. sublime* Grzyb. and *Proteonina comp nata* Franke.

CONSPECTUS

Two assemblages of agglutinative microfauna have been differentiated within variegated Eocene beds: one in the red shales, the other in the grey and green les. Their specific composition is virtually identical, differing in the absence m the red shales of *Cyclammina amplectens* Grzyb., an index Eocene form, orded here from the grey-green shales, and in the great copiousness of *Glomo-ra charoides* (Jon. & Par.).

The agglutinative fauna yielded by the sub-Magura beds is meagre and non-racteristic. The microfauna of the Magura beds within the Sól area has not n studied.

There is almost complete lack of fauna within the Krosno beds of the Sól th unit. Eocene fauna, mostly composed of abundant *Cyclammina amplectens* zyb., and *Cystammina subgaleata* Vaš., is yielded by menilitic beds. The strati-phic position of the former of these species, thus far held as index fossil of the iegated Eocene beds, is extended to younger strata since it is encountered in shales of menilitic beds. Two specimens of species *Nummulites variolarius* k., by F. Bieda referred to the Eocene, have been recorded from menilitic beds the Sól unit.

Eocene microfauna is also yielded by sub-menilitic beds. The available terial is not adequate enough for an age assignment to the pre-Magura unit. e series shown in table I is distinctly that of sandstones, while the few shale ercalations lack any microfauna.

ief Laboratory for Oil Industry
Kraków, November 1956

DESCRIPTION ON FIGURES IN THE POLISH TEXT

Fig. 1 (p. 405)
Geological map of the Słonica river valley
Del. H. Kozłowska & F. Szymakowska

sandstone series of the Inoceramus beds; *2* shale-sandstone series in same; sandstone series of variegated Eocene beds; *4* shale-sandstone series of same; sub-Magura beds; *6* Magura beds; *7* dislocations; *8* anticline axis; *9* soil creep

Fig. 2 (p. 410)
Geological map of the *Inoceramus* beds dome in Sól near Zwardoń
Del. H. Kozikowski

sandstone series of *Inoceramus* beds; *2* shale-sandstone series in same; *3* rnfelses; *4* sandstone series of variegated Eocene beds; *5* red shales in same; shale-sandstone series in same; *7* sub-Magura beds; *8* Magura beds; *9* strike, dip and position of hieroglyphs; *10* dislocations; *11* soil slip; *12* salt water sources

Chart 1 (p. 414)
omparison chart of microfauna sites in the Słonica valley and stratigraphical sites of the same species as shown by other authors

microfauna from the Słonica valley; *1 Inoceramus* beds from Gorlice *(7)*; ditto from Szymbark near Gorlice *(4)*; ditto from Rzeszów and Dębica *(6)*

Chart 2 (p. 415)

Occurrence chart showing known age distribution of microfauna conspecific w
that recorded from the Słonica valley
(after d'Orbigny *19*, Grzybowski *9*, *10*, Friedberg *6*, Dyłążanka *4*, Brady *1*, Cushman
Ellis & Messine *5*, Guzik & Pożaryski *10*)
Microfauna from the Słonica valley; 1 — Upper Cretaceous; — Tertiary: 2 Paleoce
3 Eocene, 4 Oligocene, 5 Miocene, 6 Pliocene; 7 — Recent

Table I (facing p. 410)

Transverse geological section of Sól near Zwardoń

Del. H. Kozikows

A Magura nappe: 1 sandstone series of *Inoceramus* beds; *2* shale-sandstone seri in same; *3* sandstone series in variegated Eocene beds; *4* shale-sandstone series same; *5* sub-Magura beds — *B Sól depth unit: 6* sub-menilitic Eocene beds; *7* san stones and conglomerates; *8* menilitic shales; *9* thickly bedded sandstone series Krosno beds; *10* shale-sandstone series of same — *C sub-Magura unit (?): 11* thick bedded sandstones intercalated by black shales (Krosno beds); *12* grey shales (Kr sno beds); *13* thickly bedded sandstones intercalated by black shales (Kros beds) — *14* Quaternary beds — *15* lines of dislocations — *16* depth water leve (indicated by Roman numerals)

КИРХНЕР

СТРАТИГРАФИЯ МИОЦЕНА НА ПРЕДГОРЬИ КАРПАТ НА ОСНОВАНИИ МИКРОФАУНЫ

(Резюме)

Автор поставил себе задачу расчленить миоценовые отложения на предгорьи дних Карпат и установить стратиграфическую позицию химических осадков тих отложениях.

Автор произвел детальный микрофаунистический анализ миоценовых осадков предгорьи средних Карпат. На исследованной территории выделены 13 микро- унистических горизонтов (см. фиг. 1 в польском тексте). Особенное стратигра- ческое значение представляет 1-ый дендрофриовый горизонт, подстилающий тические осадки, и глобигериновый горизонт, залегающий выше этих осадков. оба микрофаунистические горизонты устанавливают стратиграфическую по- ию химических осадков.

На основании своих работ и данных литературы автор приходит к заключе- о, что химические осадки на предгорьи Карпат образованы в конце нижнего тона и принадлежат к одному стратиграфическому горизонту.

Z. KIRCHNER

MIOCENE STRATIGRAPHY OF THE CENTRAL CARPATHIAN FORELAN BASED ON MICROFAUNAL STUDIES

(Summary)

ABSTRACT: A stratigraphical column of the Miocene deposits in the Centr Carpathians Foreland is given on ground of microfaunal studies. and the stra graphic position of the chemical Miocene sediments is determined.

A detailed microfaunistic analysis of the Miocene deposits in the Centr Carpathians Foreland is given here. Investigation work was extended to a numb of deep subsurface sections, as well as of field outcrop sections from 24 sites the Mielec area, also from the localities of Siedlec, Kłaj near Bochnia, Pilzn Lipiny, Latoszyn near Pilzno, and from the area of Tarnów, Rzeszów, Przewor Biłgoraj and the entrance of the river San into the Vistula river. 13 microfauni horizons have been recognised by the writer within the investigated area (fig. 1 in the Polish text), most of which show a geographical range extending beyond the Central Carpathians Foreland region. Some of the horizons stre from Austria through Czechoslovakian territory and the Carpathians Forel into the Transcarpathians and Rumania. Of special stratigraphic importance the *Bulimina* bed of the *Dendrophrya* horizon I. underlying the chemical sedimen and the *Globigerina* horizon resting on these sediments. The *Anomalina* horiz with its geographic range shown in the sketch map (fig. 2) is a good time mark for the stratigraphy of the Miocene deposits in the Carpathians Foreland.

The differentiation of the microfaunistic horizons led to the correlati of the several profiles (fig. 1). The sections here shown suggest the intermedia position occupied by chemical sediments between the *Bulimina* beds of t *Dendrophrya* horizon. Chemical sediments enclosed between stratigraphical equivalent microfaunistic horizons are themselves stratigraphically equivale Hence the chemical sediments within the investigated area are contemporaneo or almost contemporaneous. On evidence of his own research work and on da taken from literature the writer asserts that chemical sediments in the Carpathia Foreland have formed at the close of the Lower Tortonian period and that th constitute one stratigraphic horizon.

Chief Laboratory for Oil Industry
in Cracow
Kraków, June 1956

DESCRIPTION OF FIGURES IN THE POLISH TEXT

Fig. 1 (p. 424)

Microfaunistic sections from Siedlec, Kłaj, Pilzno, Lipiny and Mielec

Uvigerina horizon; *2 Dendrophrya* horizon I, *2a Orbulina* bed, *2b Bulimina* bed, bed poor in fossils; *3* chemical sediments horizon; *4 Globigerina* horizon, *4a* fossiliferous bed, *4b Radiolaria* bed, *4c Globigerina* bed; *5 Dendrophrya* horizon II; *Bulimina* (Miliolidea) horizon; *7* unidentified horizon; *8 Anomalina* horizon; lower horizon, poor in fossils; *10* middle horizon, more abundant in fossils; *11* per horizon, poor in fossils; *12 Articulina-Elphidium* horizon; *13* horizon poor in fossils

.rts of sections without a reference horizon number have not been worked out in detail. Obliquely striped parts of sections refer to a Mesozoic substratum

Fig. 2 (p. 438)

:etch map of the occurrence of the *Anomalina* horizon within pre-Carpathians Miocene deposits in Poland

:gend: Continuous line indicates the northern boundary of the Carpathian overth-st; the dotted line — the northern boundary of marine Miocene; the hypothetical nge of the *Anomalina* horizon is shown by dashes. Circles indicate sites of occur-nce of the *Anomalina* horizon as recorded by the present author, solid triangles — those recorded by other authors

;ИГНЕВ ФАЙКЛЕВИЧ

РЕЗУЛЬТАТЫ ИНТЕРПРЕТАЦИИ АНОМАЛИИ СИЛЫ ТЯЖЕСТИ В ЮЖНОЙ ЧАСТИ ПОМОРСКОГО ВАЛА

(Резюме)

В этой статье даны результаты интерпретации гравиметрической съемки ıс. 1 в польском тексте), проведенной с целью исследования тектоники Поморого вала. Здесь применялся метод второй вертикальной производной потенциасилы тяжести.

На основании вычисленных значений вертикальных градиентов W_{zz} по граметрической карте были вычерчены изолинии градиента (рис. 3). В картине эдставляемой этой картой обнаруживаются значительные отклонения от граметрической картины. Общая антиклинальная форма вала, представленная на ıвиметрической съемке распадается на четыре массива, отделенные между сой глубокими понижениями.

Первое из них пробегает вдоль предполагаемой оси вала (NW-SE). Его илстрируют отрицательные значения, заключенные между нулевыми изолиниями.

Второе понижение тоже отмечается полосой отрицательных значений. Оно эбегает от P через S в район, расположенный к западу от K. Эти два направения пересекаются в округе бурения в S.

На рисунке № 4 представлен профиль P-S-K_1-Z_1, в котором сопоставлены ивая Δg изменения силы тяжести, кривая вертикального градиента и геология, лученная на основании бурений.

Мы видим, что кривая вертикального градиента немного отличается от фор- границы между лейасом и третичными породами.

На основании сказанного нужно констатировать, что вал не представляет юродной антиклинальной формы, но что существует в месте предполагаемого ксимума антиклинали понижение, разделяющее его на две антиклинальные юлообразные формы. Профиль A-S-K_1-Z_1 имеет целью представить приблинную форму южного гребня.

Дискуссия. — На основании гравиметрической интерпретации, а также бурей была составлена геологическая карта, которая в значительной степени отлиется от геологической карты, составленной на основании бурений, проведенных время до конца марта т. г.

Для этой новой карты характерными являются вышеописанные понижен
Надо предполагать, что профили B-C и D-E связаны с такой же тектоникой,
они не подтверждены никаким бурением. Понижение, простирающееся от P че
S в район, расположенный к западу от K, обнаруживается лишь гравиметричес
интерпретацией.

Автор предполагает, что район отрицательных значений около P[1] свя
с вторичным углублением либо с незрелым соляным куполом.

Если бы в этом районе было проведено хотя бы одно глубокое бурение,
ходящее до кристаллических пород, то на основании гравиметрической инт
претации можно было бы получить данные относительно его формы.

FAJKLEWICZ

GRAVITY ANOMALIES IN THE SOUTHERN PART OF THE POMERANIAN RIDGE

(Summary)

STRACT: Results of interpretation of gravity anomalies in the southern part the „Wał Pomorski" (Pomeranian Ridge, Poland) are presented. The method of second vertical derivative of the gravity potential is applied here. Two de- ssions and their crossing are differentiated and a new geological map of the investigated area is outlined.

This paper presents the results of a new interpretation of the gravity survey e fig. 1 in the Polish text) in order to investigate the tectonics of the southern t of the Pomeranian Ridge, the method of the second vertical derivative of the vity potential was applied here for this purpose.

Lines of equal gradient (fig. 3) were drawn on the basis of W_{zz} values cal- ated from gravity survey data.

The image presented on the resulting map differs considerably from the vity image. The simple anticlinal shape of the Ridge shown on the gravity map pears now as split into four heights separated by deep depressions.

The first depression runs along the supposed axis of the Ridge (NW-SE) and marked by negative gradient values in the space between the zero contour lines.

The second one is also marked by a strip of negative values running from through S into the area west of K. The crossing of both depressions is situated the vicinity of the bore-hole at S.

Fig. 4 shows the gravity curve Δg along the profile line P-S-K_1-Z_1 together th the vertical gradient curve and the geological cross section deduced from ring data. One can see that the shape of the gradient curve is almost similar to shape of the boundary between the Liassic and the Tertiary.

This leads to the conclusion that the Ridge does not consist of a simple anti- nal form but that just where the anticline was supposed to culminate, there must a depression separating the Ridge into two dome shaped features. The profile S-K_1-Z_1 is drawn to show the approximate form of the southern branch of the dge.

Discussion. — On the basis of the new interpretation of the gravity survey d new boring results a new geological map of the investigated area was outlined.

* Abbreviated name of the locality (for full names see below in the legend fig. 1).

It differs considerably from the earlier geological map based on bores drilled up the end of March 1956.

The characteristic features of the new map are the above mentioned pressions. It is presumed that the B-C and D-E profiles are also linked with the sa tectonics, but as yet this is not proved by any drilling. The existence of the pression running from P through S into the area west of K_1 is merely dedu from the gravity survey interpretation. The author suggests that the area of ne tive values around P' may correspond either to a secondary depression in structure or to an immature salt plug.

If in the investigated area only one bore had been drilled deep enough reach the crystalline basement, it would be possible to get from the gravity int pretation further data about its surface shape.

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Kraków, May 1956

DESCRIPTION OF FIGURES IN THE POLISH TEXT

Fig. 1 (p. 452)

Gravity anomaly in the southern part of the Pomeranian Ridge
(Bouguer's reduction)

Names of localities: B — Badecz, BG — Biała Góra, G — Grabowno, J — Jastrow K — Krajenka, K_1 — site near Krajenka, Kn — Kujan, L — Liszkowo, Ł — Ło żenica, P — Piła, P' — Płytnica, R — Radzicz, S — Skórka, Sz — Szwecja, W — W tankowo, Wk — Wyrzysk, Z — Złotów, Z_1 — site near Złoczów

Fig. 2 (p. 456)

Computation pallette for the vertical gradient from the gravity map

Fig. 3 (p. 456)

Anomaly of the gravity vertical gradient in the southern part of the Pomerani Ridge

Lines of profiles indicated by broken line. Explanation of letters — as in fig.

Fig. 4 (p. 457)

Approximate forms of the northern and southern branches of the Pomeranian Ric

Lines of profiles see fig. 3

Legend: *1* Quaternary and Tertiary; *2* Dogger; *3* Lias

Fig. 5 (p. 459)

Geological map of the Liassic beds surface in the southern part of the Pomerani Ridge outlined on ground of the gravity interpretation and boring data

1 — positive, 2 — negative denivelations of the Liassic beds surface

Fig. 6 (p. 460)

Approximate forms of the Pomeranian Ridge

D-E profile — through the neighbourhood of the localities Płytnica, Badecz

B-C profile — through the neighbourhood of the localities Szwecja, Witankow

Legend: *1* Quaternary and Tertiary; *2* Lias

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